**LAB 2 GHP EVIDENCE FOR CHEMICAL CHANGE**

***Objectives:***

To observe the types of evidence that indicate a chemical change has taken place.
To infer from the observation of chemical change that a new substance has been formed.

***Materials:***

| | |
|---|---|
| Pyrex test tube 13 x 100 mm | test tube rack |
| 100 ml beaker | wire gauze |
| Bunsen burner | ring stand |
| Ruler | iron ring |
| Lab wax pencil | stirring rod |
| Stirring rod | |
| | |
| Copper(II) nitrate | hydrochloric acid |
| Sodium hydroxide | 12 cm. piece of aluminum wire |

***Procedure:***

1. In the 100 ml beaker, make a 50 ml water bath by heating until boiling. This will be used in Step 5.

2. While the water bath is heating, make three marks that are 1 cm apart on a 13 x 100 cm test tube. Make the marks from the bottom up.

3. Add copper(II) nitrate to the first mark on the test tube.

4. Add sodium hydroxide to the second mark on the test tube. AVOID CONTACT WITH SKIN AND EYES. Mix with the stirring rod. Rinse the stirring rod. Touch the bottom of the outside of the test tube to see if heat has been released. The copper containing product is copper(II) hydroxide. The other product is sodium nitrate.

   *Observation:* _____

5. Put the test tube in the water bath you started in Step 1. Heat it until no more change occurs. The products are copper(II) oxide and water.

6. Remove the test tube from the hot water bath. Turn off the burner. Cool the test tube and its contents for 2 minutes in room temperature water. Add hydrochloric acid to the third mark. Mix with the stirring rod. Rinse the stirring rod. The products are copper(II) chloride and water.

Place the piece of aluminum wire in the test tube. Leave it until no more reaction is observed. Touch the bottom of the test tube to check for temperature change. Two reactions take place. Copper(II) chloride and aluminum produce copper and aluminum chloride: $CuCl_2$*(aq)* + Al → $AlCl_3$*(aq)* + Cu
The aluminum also reacts with the hydrochloric acid to form hydrogen and aluminum chloride: Al + HCl*(aq)* → $H_2$ + $AlCl_3$*(aq)*

*Observation:* _____

7. Remove the wire from the test tube and compare the copper formed in the test tube with a sample of copper wire.

   *Observation:* _____

8. Dispose of all chemicals as directed and clean your glassware. Put all equipment away in its proper place.

***Questions:***

1. What sorts of things did you do in lab to create chemical changes?

2. In what two ways is heat involved in chemical change? Cite specific steps in the experiment in your answer.

3. List all the substances used or produced in this lab. Then, identify each as an element or a compound.

4. In the last step of the experiment, where is the aluminum chloride? How could you recover it as a solid compound?

5. What is the color of solutions of copper compounds?

6. Which substances in this experiment dissolve in water (they form solutions)? Which do not? (meaning, they form solid precipitates).

7. List four types of observations that indicate when a chemical change has occurred.